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PROVISIONAL SPECIFICATION

Improvements in or relating to Change-speed Gears

I, SHADWELL HARRY GRYLLS, a British Subject, of "Marazion," Lime Avenue, Duffield, near Derby, Derbyshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to change-speed gears suitable for use in the power-transmission system of a motor vehicle, and has for its object to provide an improved construction whereby the provision of a clutch between the engine and the gear and an operating pedal therefor can be avoided; it is particularly suited for transmission systems in which a "fluid flywheel" or hydraulic clutch, or a hydraulic torque-converter, or an automatic centrifugal clutch, is used.

According to this invention, a change-speed gear for a motor vehicle comprises in combination an input shaft, an output shaft, a clutch arranged to engage them directly with each other, a single layshaft, gears thereon meshing respectively with gears on the input and output shafts, a freewheel clutch between the layshaft and one of its gears arranged to transmit a drive to the output shaft, and a clutch operable at will to engage said shaft and said gear.

According to another feature of this invention there may also be provided a freewheel clutch between the input and output shafts, so arranged as to transmit a drive from the output shaft to the input shaft.

In one embodiment of this invention which will now be described by way of example, the input shaft is driven through any desired form of automatic clutch as above described from the engine, and it carries one element of a friction clutch of which the co-operating element is carried by the output shaft. This clutch is arranged to be operated by the change-speed lever, and when engaged it provides a direct connection which conveniently is the high gear ratio of the change-speed gear.

On the input shaft there is provided a gear wheel meshing with a gear wheel mounted on a layshaft, and these gears are so dimensioned as to give a speed reduction from the input shaft to the layshaft. A freewheel clutch is interposed between the layshaft and its gear, this clutch being arranged so as to transmit a drive from the gear wheel to the layshaft, and to permit the layshaft to overrun the gear wheel when the shaft is running at a higher speed. On the layshaft there is secured a second gear which meshes with a gear on the output shaft, and these may be arranged to give a further reduction in speed or may be the same size as each other if the desired ratio can conveniently be obtained in the first stage of the gear. Alternatively the whole reduction in speed may be obtained on the second stage if desired.

There is also provided on the layshaft a friction clutch whereby the first layshaft gear can be clutched to the shaft, thereby rendering the freewheel connection between them inoperative.

There is also provided, according to another feature of this invention, a freewheel clutch between the input shaft and the output shaft, this freewheel being arranged so as to permit the input shaft to overrun the output shaft when the latter is being driven through the reduction gear.

In the operation of this gear the high gear drive is obtained by engaging the first-mentioned clutch which couples the input and output shafts together, and the low gear drive is obtained by releasing this clutch; the drive then takes place from the input shaft gear wheel to the first layshaft gear wheel, and through the freewheel connection to the layshaft and thence through the other two gears to the output shaft. In this way a positive coupling is provided, as distinct from a friction clutch, to accommodate the increased torque which is transmitted on the lower ratio.

The braking effect of the engine is always available on the high gear drive through the freewheel, whether the friction clutch is engaged or disengaged; when the low gear drive is in use, however, if the output shaft tends to overrun the input shaft the freewheel on the layshaft would become operative, and therefore the friction clutch on the layshaft is

engaged so as to positively couple the output shaft to the input shaft through it, thereby enabling the low gear braking effect to be obtained.

It will be seen, therefore, that in either the high gear or the low gear drive, so long as the vehicle is in motion there is no risk of stalling the engine, since a positive drive is provided from the output shaft back to the engine until the fluid flywheel or equivalent clutch becomes disengaged at the very low speeds. In order further to prevent stalling of the engine, when neither gear is in use, the freewheel connection between the output shaft and the input shaft is provided, since as stated above it can transmit a drive from the output to the input shaft. So long as the vehicle is in motion therefore a drive will be transmitted to the engine and any risk of stalling prevented.

If more than two ratios of transmission are required, a second similar gear box can be connected in series with the first gear box, and the selection of the various clutches to be engaged are all effected by movement of the change-speed lever.

Any desired form of controllable clutches may be used, namely friction clutches such as plate, multi-plate, cone or band clutches, or positive dog clutches or any combination of these, and they may be operated mechanically, electrically, hydraulically or by air-pressure or vacuum. Finally, when an automatic clutch is used between the engine and the change-speed gear, there may be provided, in addition, an emergency jaw clutch or friction clutch.

Dated this 11th day of January, 1945.
BOULT, WADE & TENNANT,
111 & 112, Hatton Garden,
London, E.C.1,
Chartered Patent Agents.

COMPLETE SPECIFICATION

Improvements in or relating to Change-speed Gears

I, SHADWELL HARRY GRYLLS, a British Subject, of "Marazion," Lime Avenue, Duffield, near Derby, Derbyshire, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to change-speed gears suitable for use in the power-transmission system of a motor vehicle, and has for its object to provide an improved construction whereby the provision of a clutch between the engine and the gear and an operating pedal therefor can be avoided; it is particularly suited for transmission systems in which a "fluid flywheel" or hydraulic clutch, or a hydraulic torque-converter, or an automatic centrifugal clutch, is used.

According to this invention, a change-speed gear for a motor vehicle comprises in combination an input shaft, an output shaft, a clutch arranged to engage them directly with each other, a single layshaft, gears thereon meshing respectively with gears on the input and output shafts, a freewheel clutch between the layshaft and one of its gears arranged to transmit a drive to the output shaft, and a clutch operable at will to engage said layshaft and said gear.

According to another feature of this invention there may also be provided a freewheel clutch between the input and output shafts, so arranged as to transmit a drive from the output shaft to the input shaft.

The accompanying drawing shows a diagrammatic view of one embodiment of a change-speed gear according to the invention.

In this embodiment which will now be described by way of example as applied to a motor vehicle, the input shaft 1 is driven through any desired form of automatic clutch 2 as above described from the engine, and it carries one element 3 of a friction clutch 4 of which the co-operating element 5 is secured to the output shaft 6. The clutch 4 is arranged to be operated by the change-speed lever (not shown), and when engaged it provides a direct connection which conveniently is the high gear ratio of the change-speed gear.

On the input shaft 1 there is provided a gear wheel 7 meshing with a gear wheel 8 mounted on a layshaft 9, and these gear wheels are so dimensioned as to give a speed reduction from the input shaft to the layshaft. A freewheel clutch 10 is interposed between the layshaft 9 and its gear wheel 8, this clutch being arranged so as to transmit a drive from the gear wheel to the layshaft and to permit the layshaft to overrun the gear wheel when the shaft is running at a higher speed. On the layshaft 8 there is secured a second gear wheel 11 which meshes with

a gear wheel 12 on the output shaft 6, and these wheels may be arranged to give a further reduction in speed or may be of the same size as each other if the desired ratio can be conveniently obtained in the first stage, viz., the gear wheels 7 and 8, of the gear. Alternatively the whole reduction in speed may be obtained in the second stage, viz., the gear wheels 11 and 12, if desired.

There is also provided on the layshaft 9 a friction clutch 13 comprising the element 14 fixed to the gear wheel 8 and the co-operating element 15 splined to the layshaft 9 whereby the first layshaft gear wheel 8 can be clutched to the shaft, thereby rendering the freewheel connection between them inoperative.

There is also provided, according to another feature of this invention a freewheel clutch 16 between the input shaft 1 and the output shaft 6, this freewheel clutch being arranged so as to permit the input shaft to overrun the output shaft when the latter is being driven through the reduction gear comprising the gear wheels 7 and 8, and 11 and 12.

In the operation of this gear the high gear ratio drive is obtained by engaging the clutch 4 which couples the input and output shafts 1 and 6 together, and the low gear ratio drive is obtained by releasing this clutch; the drive then takes place from the input shaft gear wheel 7 to the first layshaft gear wheel 8, and through the freewheel clutch 10 to the layshaft 9 and thence through the other two gear wheels 11 and 12 to the output shaft 6. In this way a positive coupling is provided, as distinct from a friction clutch, to accommodate the increased torque which is transmitted on the lower gear ratio drive.

The braking effect of the engine is always available on the high gear ratio drive through the freewheel clutch 16, whether the friction clutch 4 is engaged or disengaged; when the low gear ratio drive is in use, however, if the output shaft 6 tends to overrun the input shaft 1, the freewheel clutch 10 on the layshaft 9 would allow it to do so, and therefore the friction clutch 13 on the layshaft 9 is engaged so as to couple the output shaft 6 to the input shaft 1 through it when the output shaft tends to overrun the input shaft, thereby enabling the low gear ratio braking effect to be obtained.

It will be seen, therefore, that in either the high gear or the low gear drive, so long as the vehicle is in motion there is no risk of stalling the engine, since a drive can always be provided from the output shaft 6 back to the engine until the fluid flywheel or equivalent clutch becomes disengaged at the very low speeds. In order further to prevent stalling of the engine, when neither gear is in use, the freewheel clutch 16 between the output shaft 6 and input shaft 1 is provided, since as stated above it can transmit a drive from the output to the input shaft. So long as the vehicle is in motion therefore a drive will be transmitted to the engine providing that the clutch 2 is running at a speed above its disengaging speed and any risk of stalling prevented.

A convenient method of obtaining more than two ratios of transmission is the one in which two or more similar gear boxes are connected in series, and the selection of the various clutches to be engaged being all effected by movement of the change-speed lever.

Any desired form of controllable clutches may be used, namely friction clutches such as plate, multi-plate, cone or band clutches, or positive dog clutches or any combination of these, and they may be operated mechanically, electrically, hydraulically or by air-pressure or vacuum. Finally, when an automatic clutch is used between the engine and the change-speed gear, there may be provided, in addition, an emergency jaw clutch or friction clutch, which would enable drive to be transmitted to the engine at speeds below the disengaging speed of the automatic clutch.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A change-speed gear comprising in combination an input shaft, an output shaft, a clutch arranged to engage them directly with each other, a freewheel clutch arranged to transmit a drive from the output shaft to the input shaft whenever the output shaft tends to overrun the input shaft, a single layshaft, gears thereon meshing respectively with gears on the input and output shafts, a second freewheel clutch between the layshaft and one of its gears arranged to transmit a drive to the output shaft, and a clutch operable at will to engage said layshaft and said gear.

2. A change-speed gear according to claim 1, the gear being arranged in series with one or more similar gears to increase the number of gear ratios.

3. A change-speed gear according to either of the preceding claims, wherein the clutches other than the freewheel clutch or clutches are of the friction or dog clutch type or combinations thereof.

4. A change-speed gear according to

claim 3, wherein the clutches other than the freewheel clutches may be operated mechanically, electrically, hydraulically or by air-pressure or vacuum.

5. A change-speed gear according to claim 1, having an automatic clutch arranged between the power unit and the change-speed gear, wherein an emergency jaw clutch or friction clutch is provided in addition to the automatic clutch.

6. The improved change-speed gear constructed, arranged and adapted for operation substantially as hereinbefore described and illustrated in the accompanying drawing.

Dated this 8th day of January, 1946.

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London, E.C.1,
Chartered Patent Agents.

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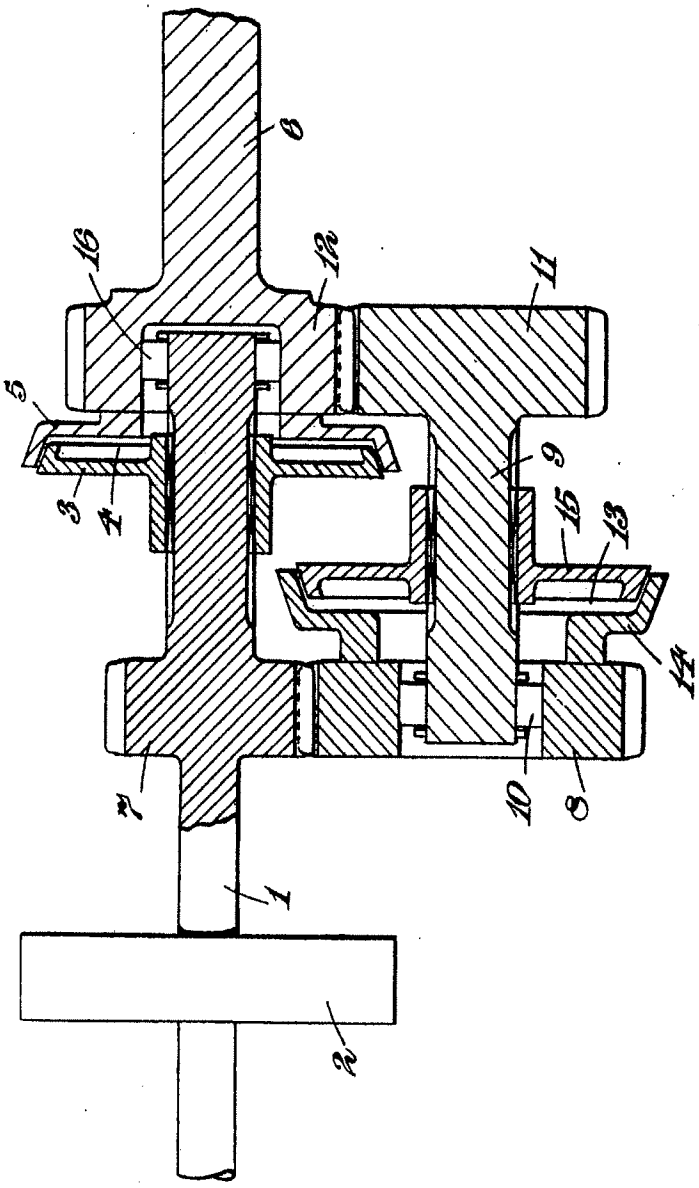

[This Drawing is a reproduction of the Original on a reduced scale.]

H.M.S.O. (Ty.P.)